

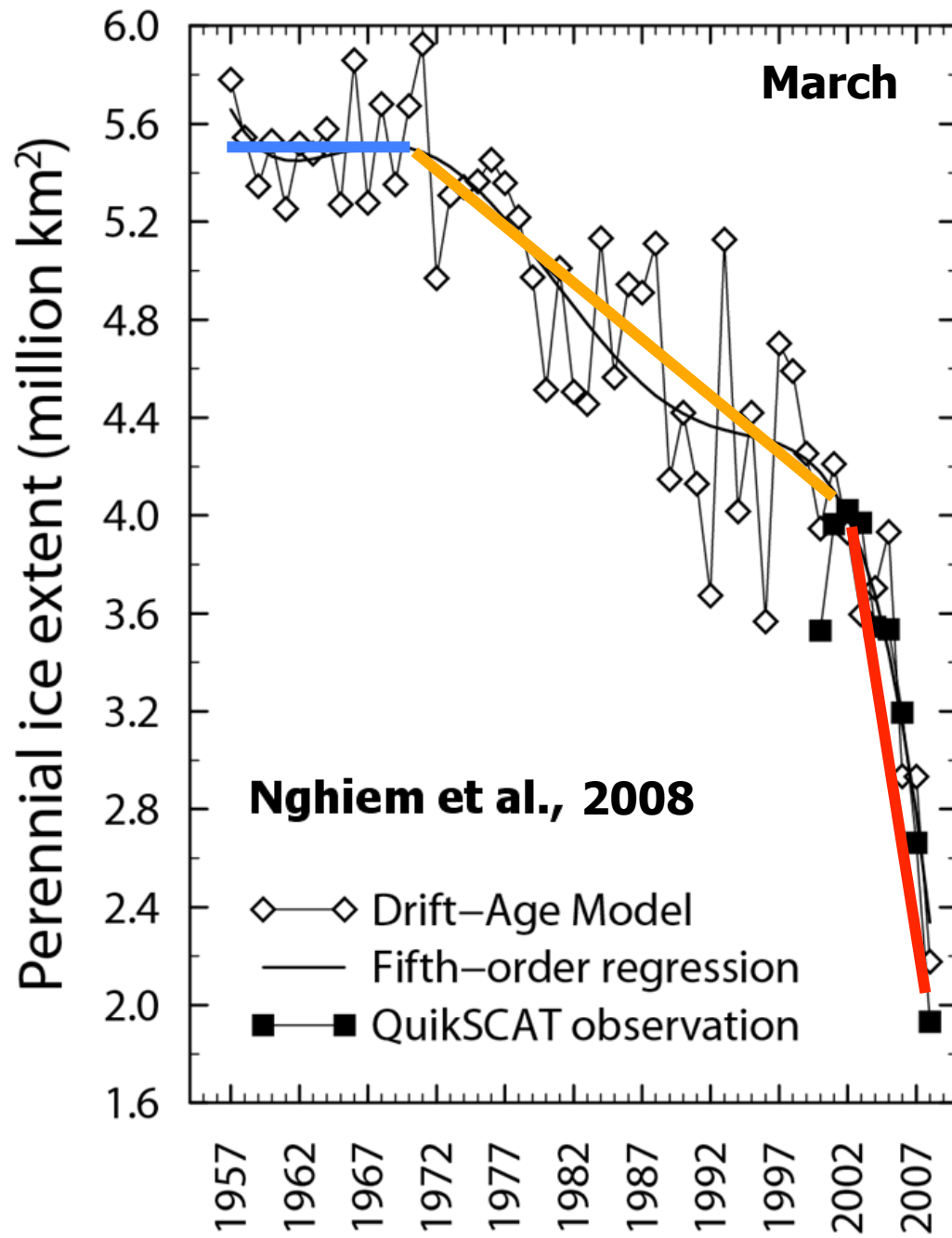
**5th Symposium on the Impacts of an Ice-Diminishing
Arctic on Naval and Maritime Operations**

Comparative Analysis of Changes in Arctic and Antarctic Sea Ice

**Presenter: S. V. Nghiem
Joint Institute for Regional Earth System
Science and Engineering (JIFRESSE)
Los Angeles, California, USA**

18 July 2013

Perennial Sea Ice Change 1957-2008



Sea Ice Change

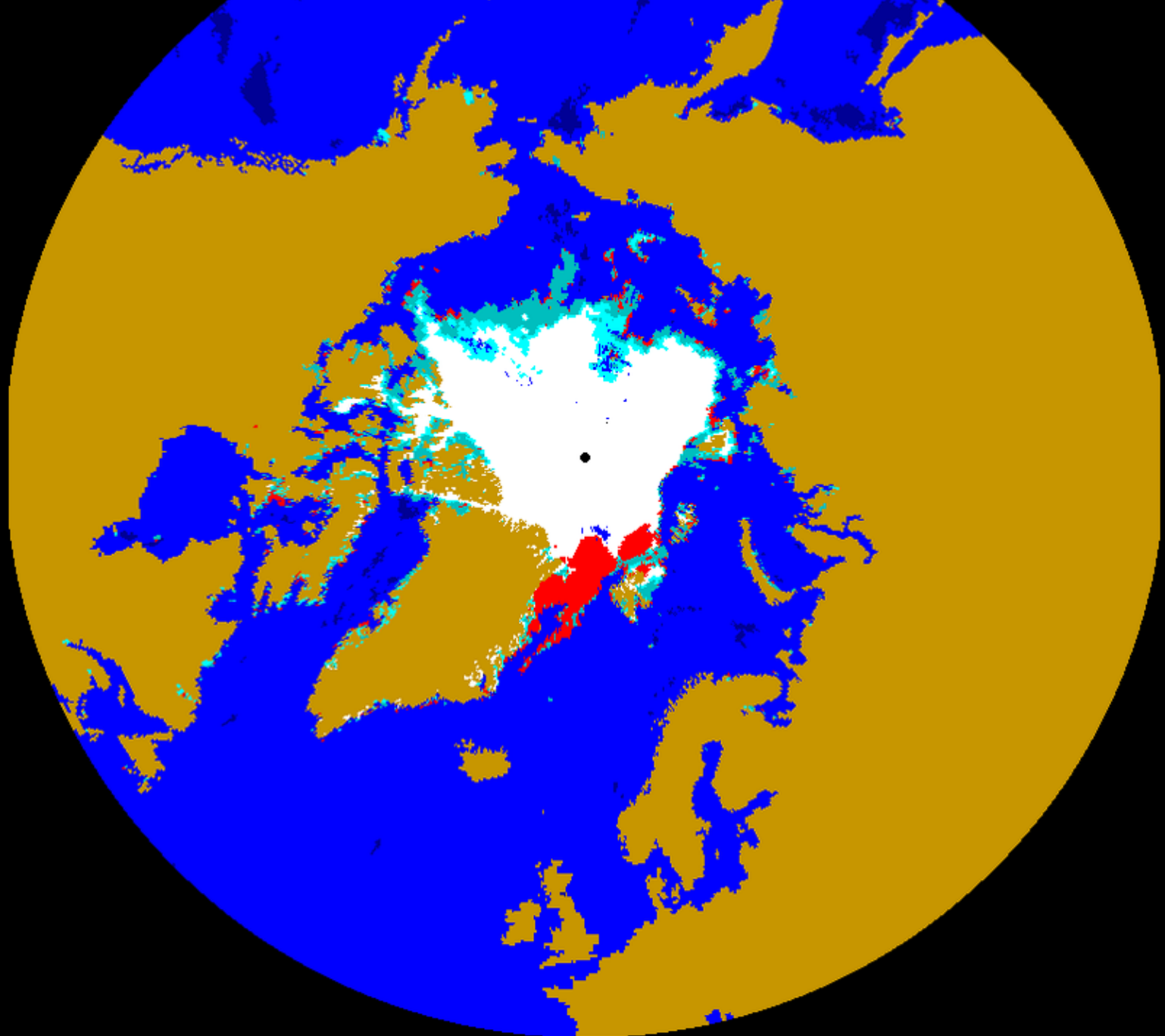
**QuikSCAT
2000-2008:**

Decrease of 1.5×10^6 km² per decade in March perennial ice extent as measured from QuikSCAT data and estimated from the Drift-Age model.

**TRIPLE THE LOSS RATE
in the previous three decades**

ICE LOSS IN WINTER AND SPRING

Animation
of sea ice
20 frames
per second
9/2008 to
5/2009



SEA ICE CLASSES

Seasonal

Mixed ice

Perennial

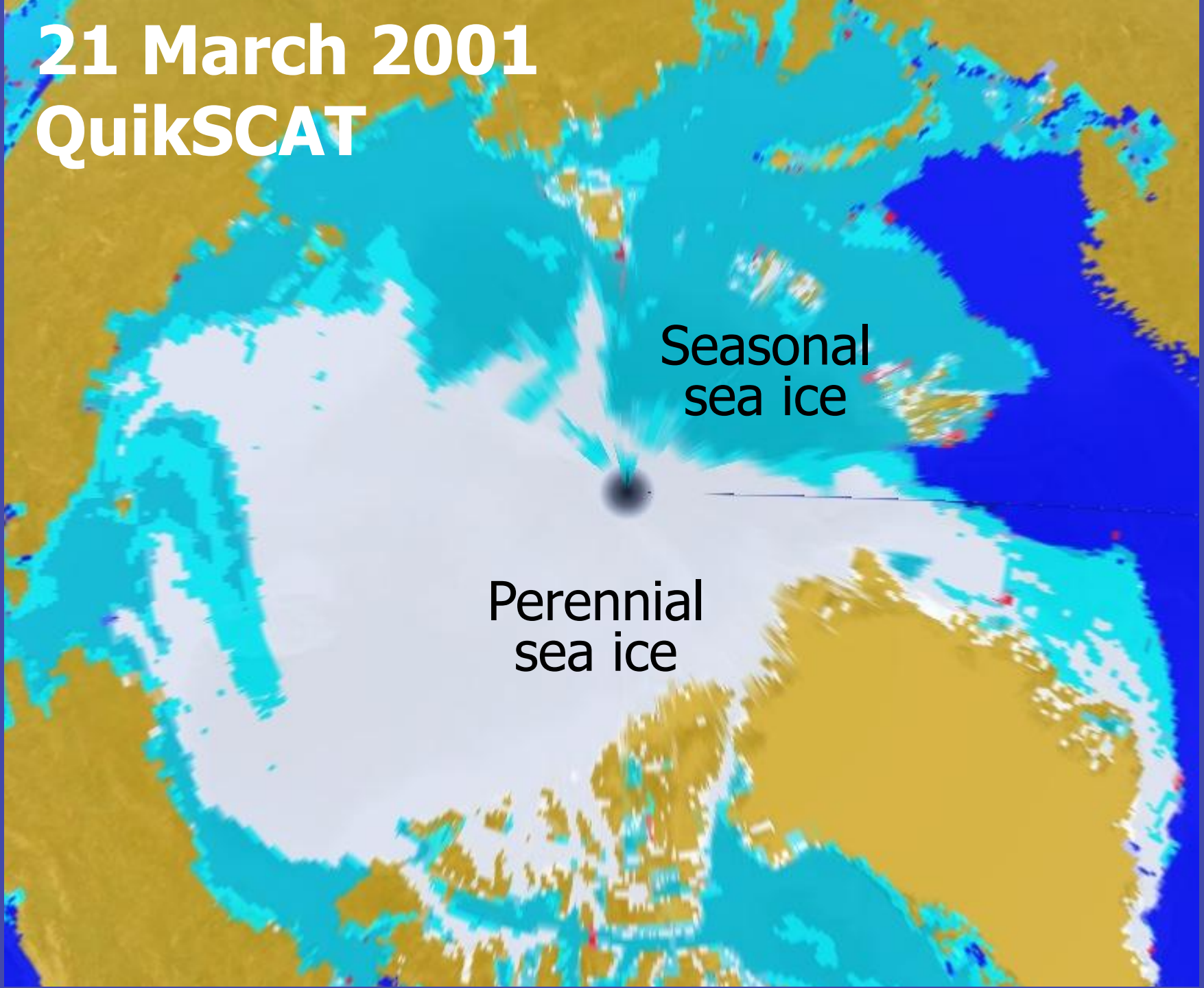
Melt

2008-09-12

21 March 2001
QuikSCAT

Seasonal
sea ice

Perennial
sea ice

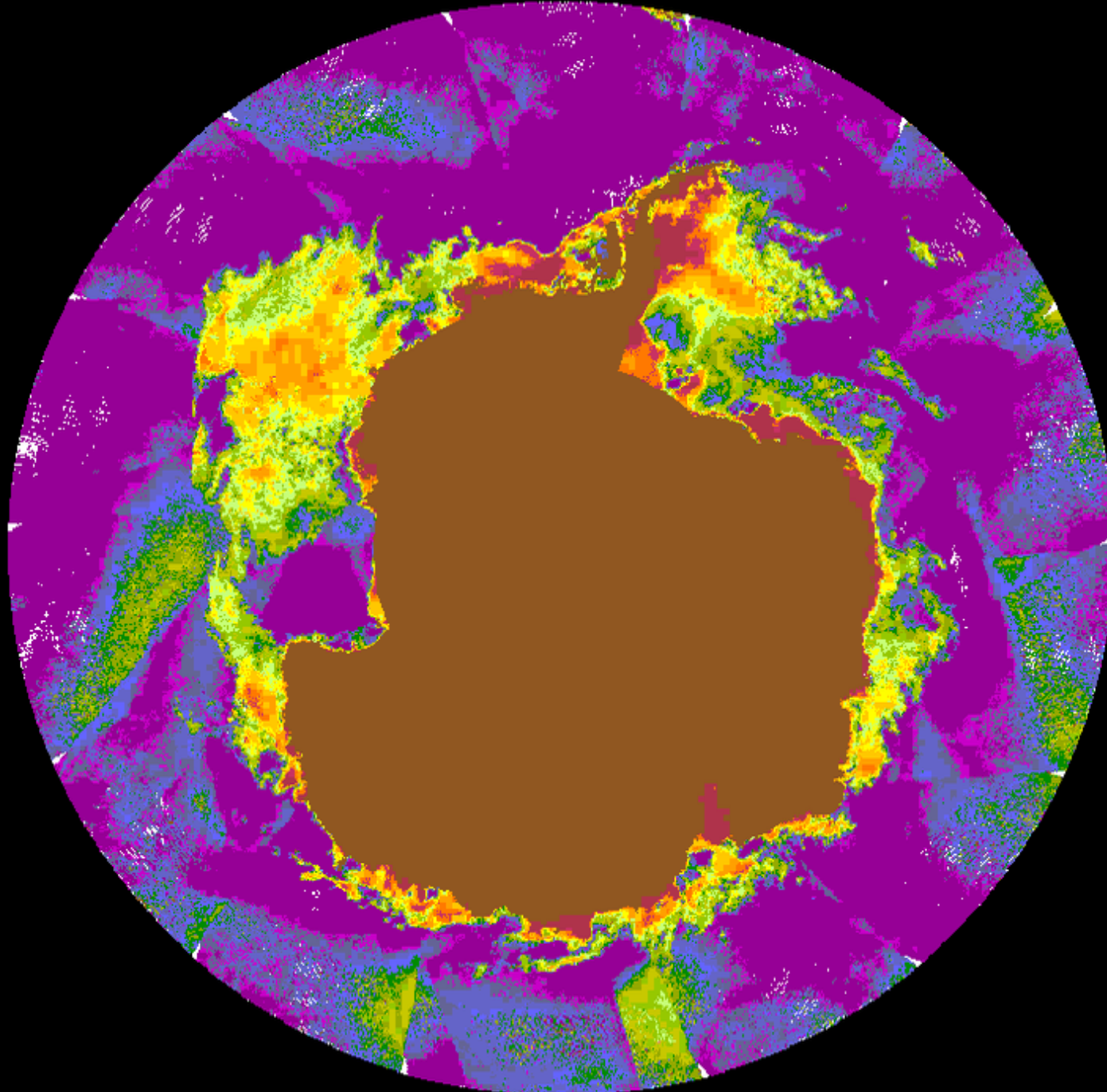


21 March 2012
Oceansat-2

Seasonal
sea ice

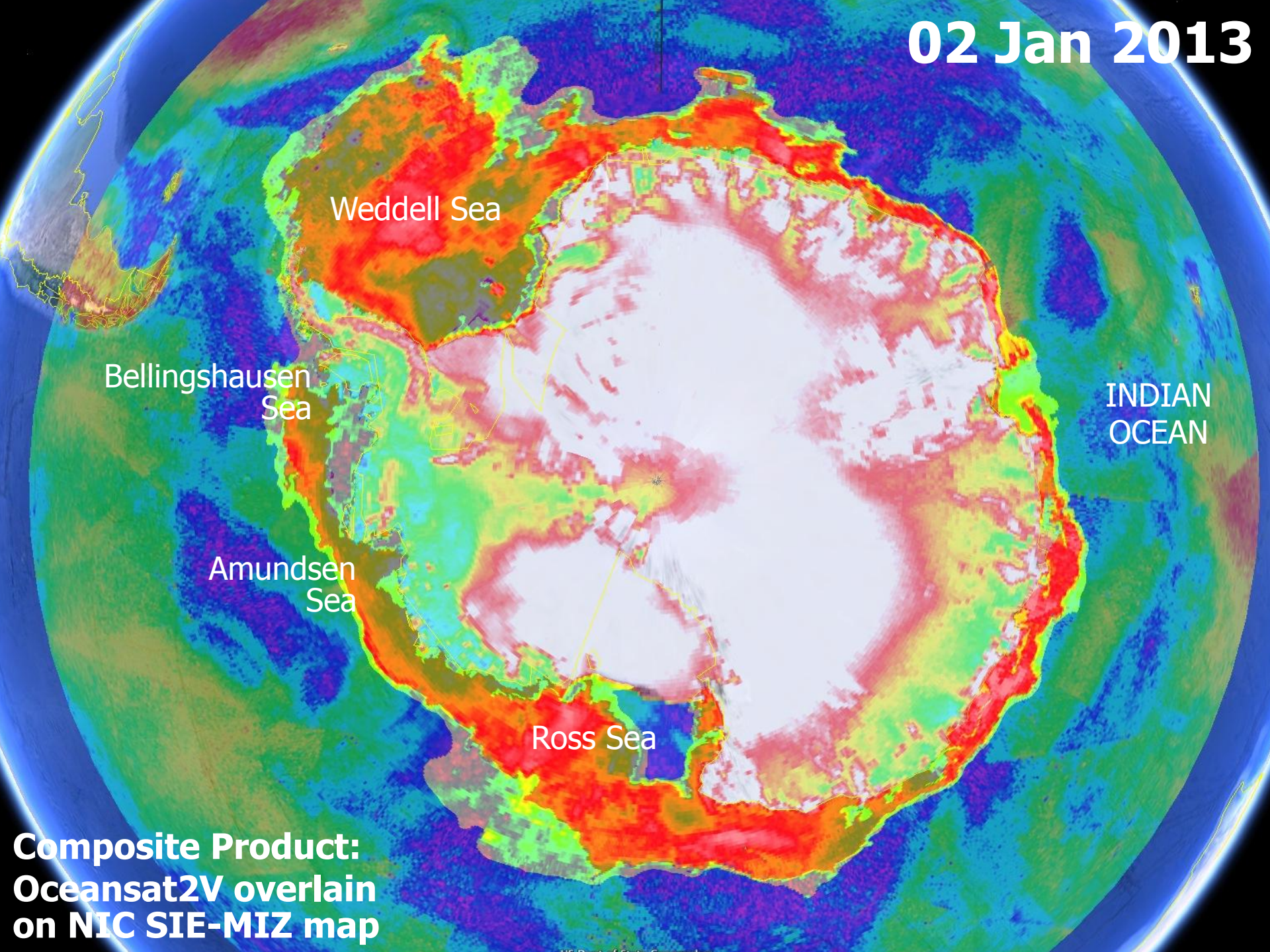
Perennial
sea ice





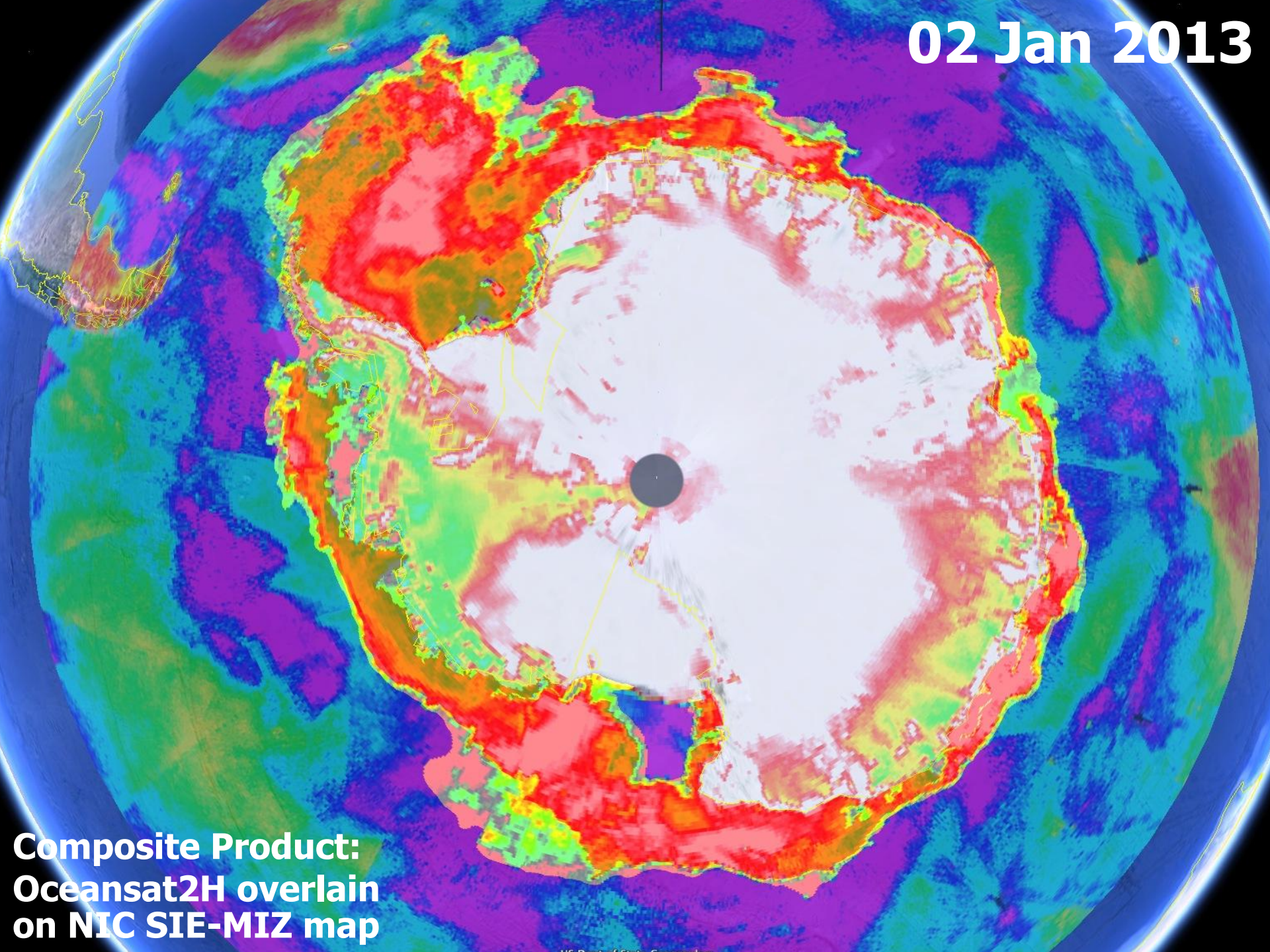
2000-01-03 H pol, .125 deg, 1:30am-7:30am

02 Jan 2013



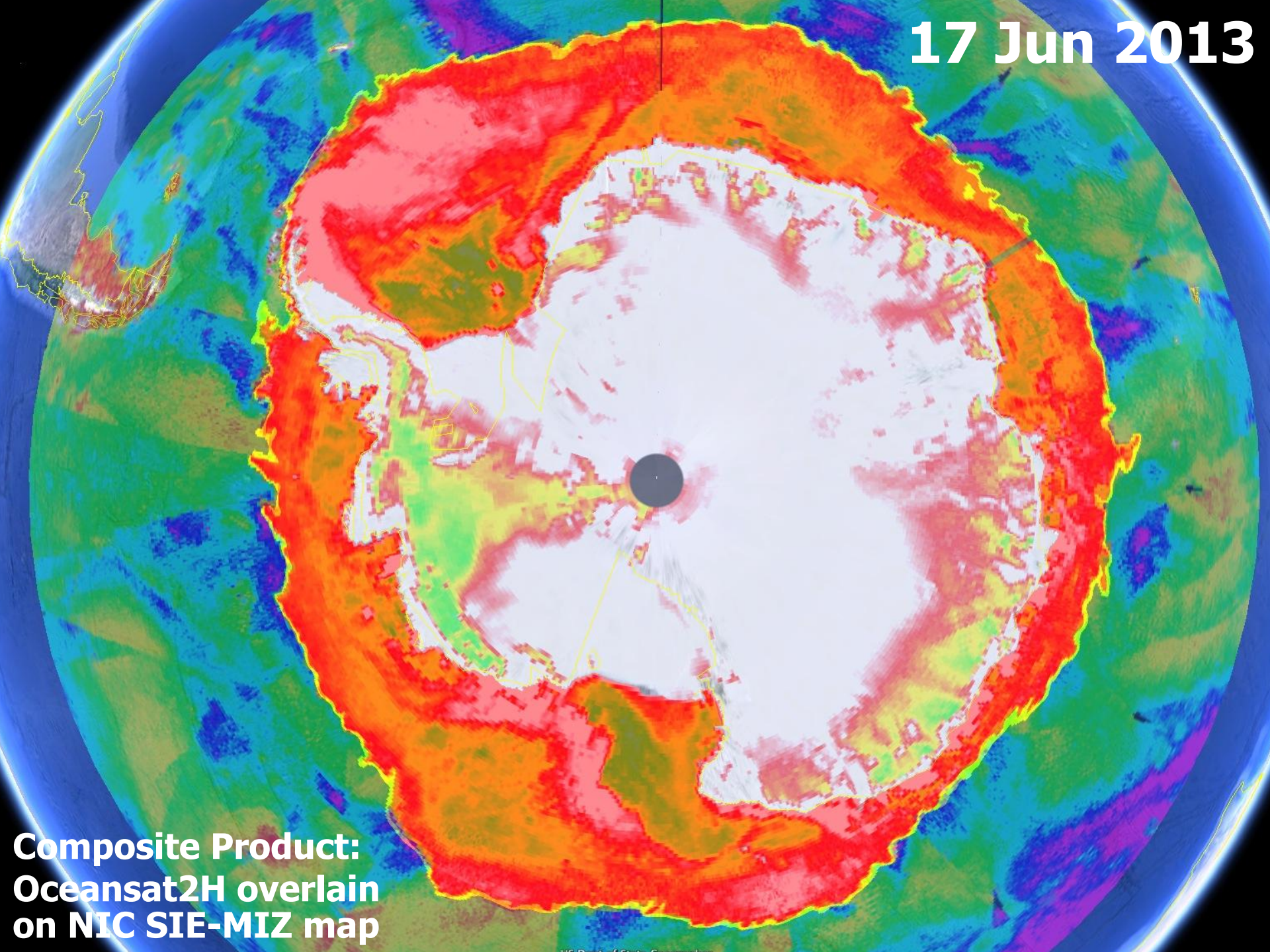
**Composite Product:
Oceansat2V overlain
on NIC SIE-MIZ map**

02 Jan 2013



**Composite Product:
Oceansat2H overlain
on NIC SIE-MIZ map**

17 Jun 2013



**Composite Product:
Oceansat2H overlain
on NIC SIE-MIZ map**

Arctic vs Antarctic Sea ice

Arctic sea ice regime shift:

Arctic sea ice has become dominated by seasonal ice.

Antarctic seasonal sea ice:

Antarctic sea ice consists mostly seasonal sea ice.

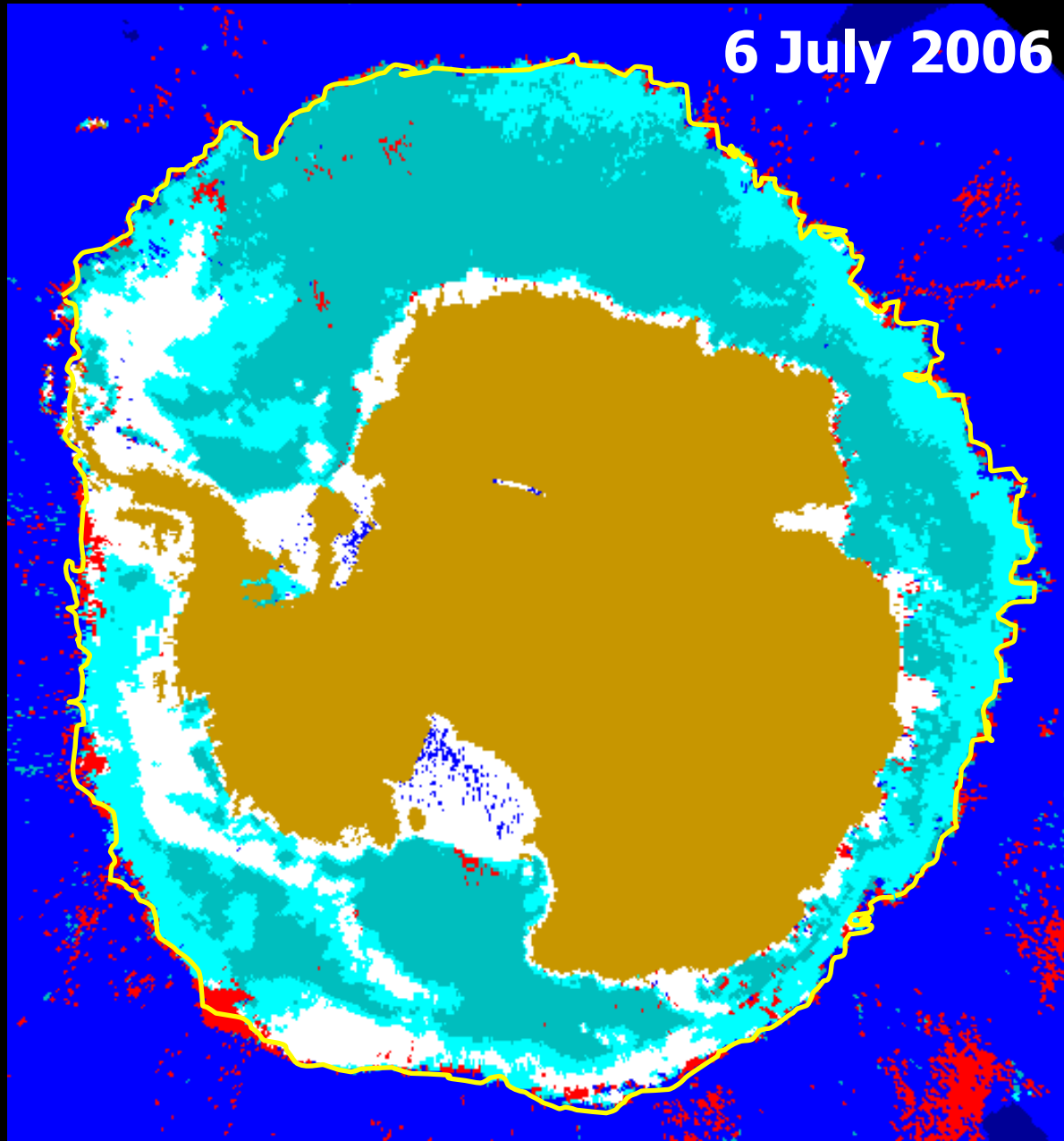
A question:

Would Antarctic sea ice be a preview of Arctic sea ice?

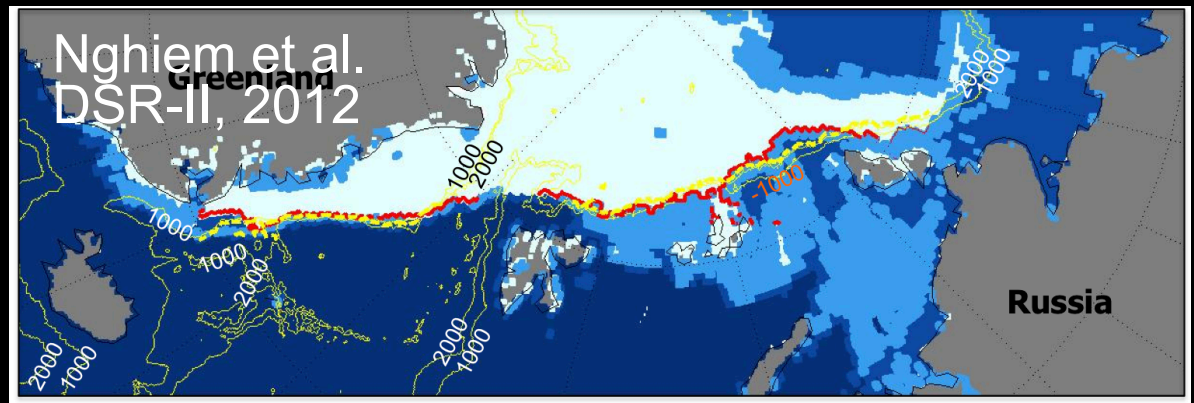
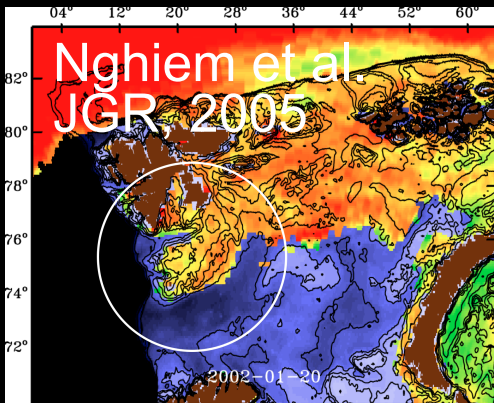
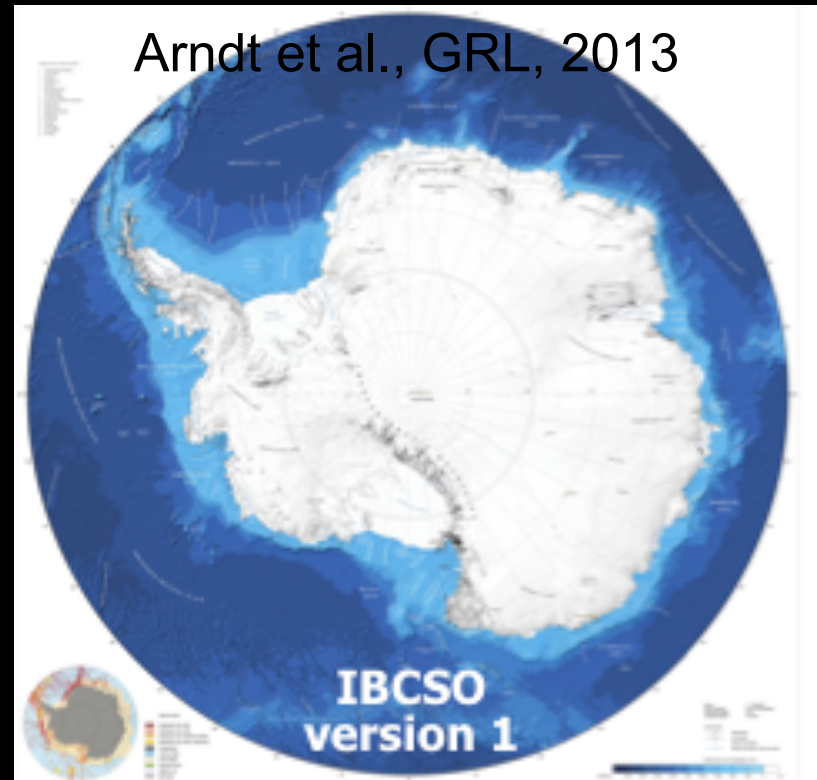
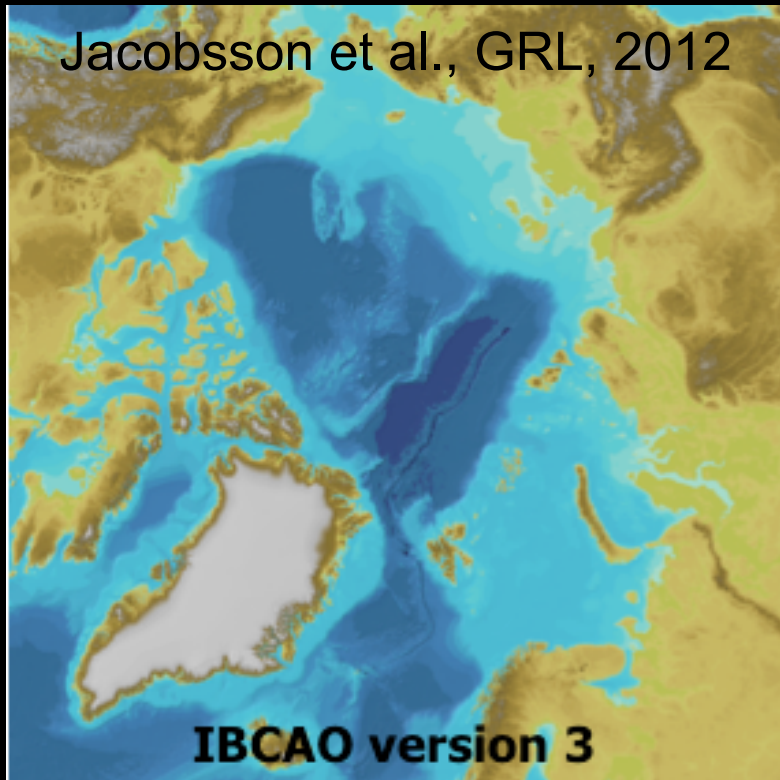
A puzzle:

Arctic sea ice decreases rapidly while Antarctic sea ice has some increase.

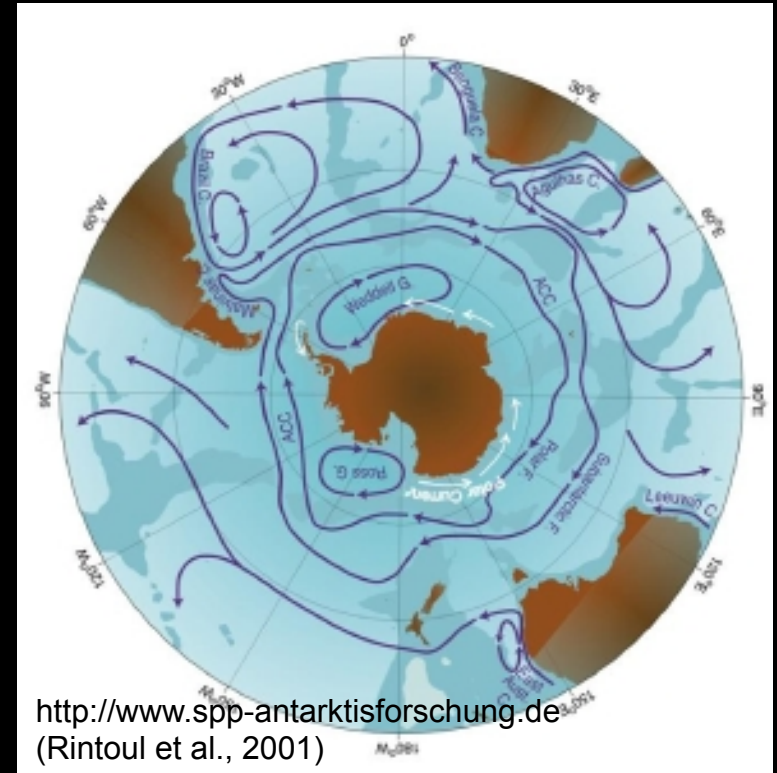
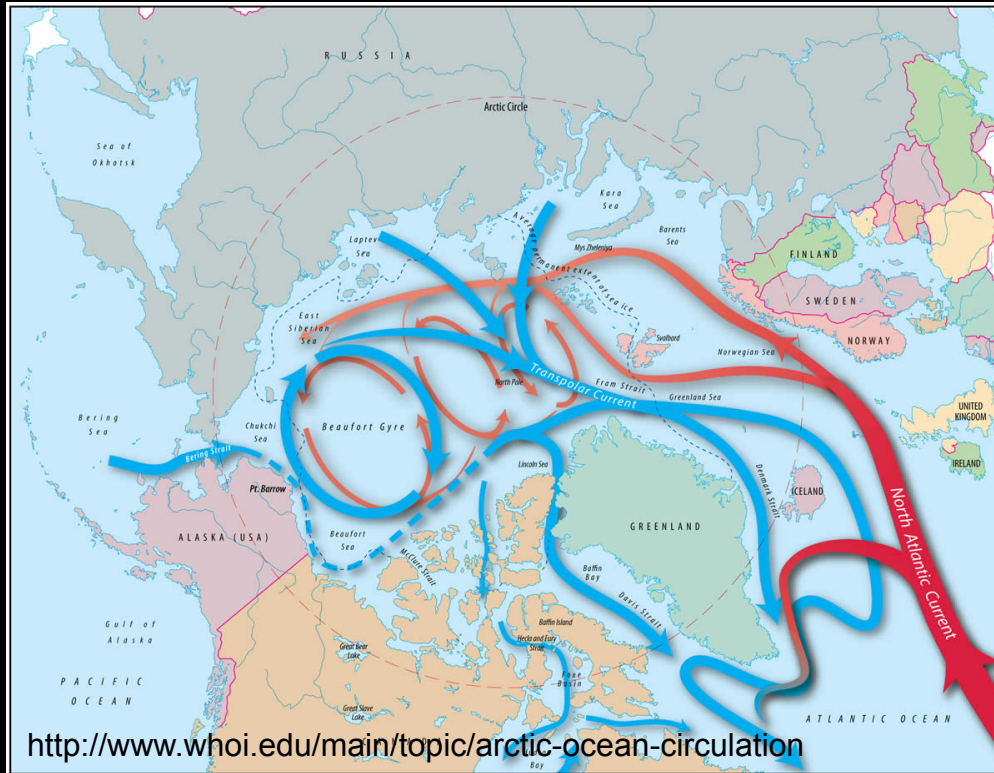
Antarctic Sea ice Classified by Arctic Signature



Bathymetry and its Role on Sea Ice Patterns

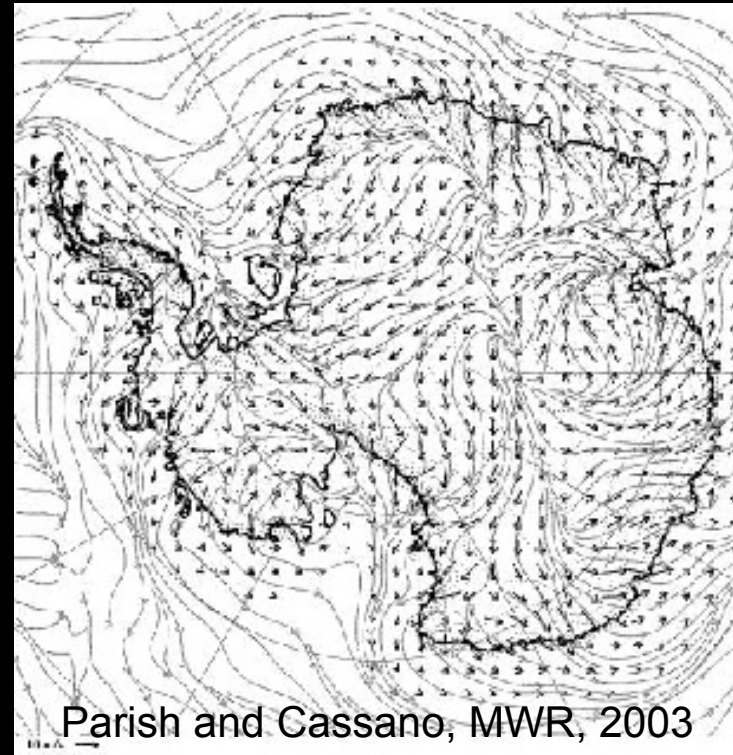
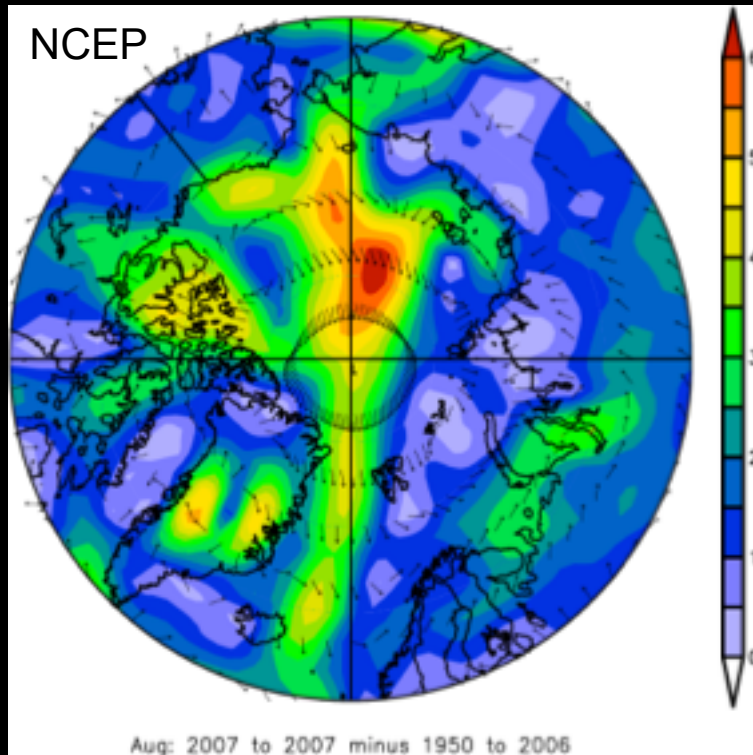


Arctic and Antarctic Currents



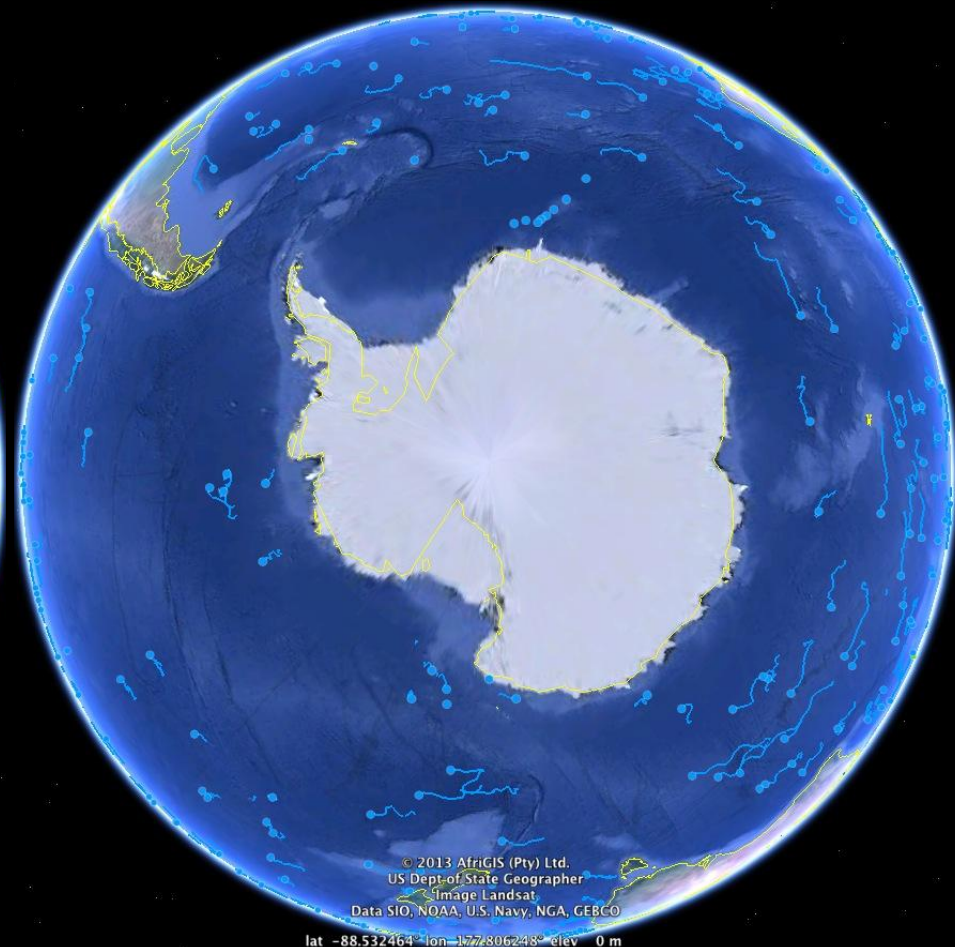
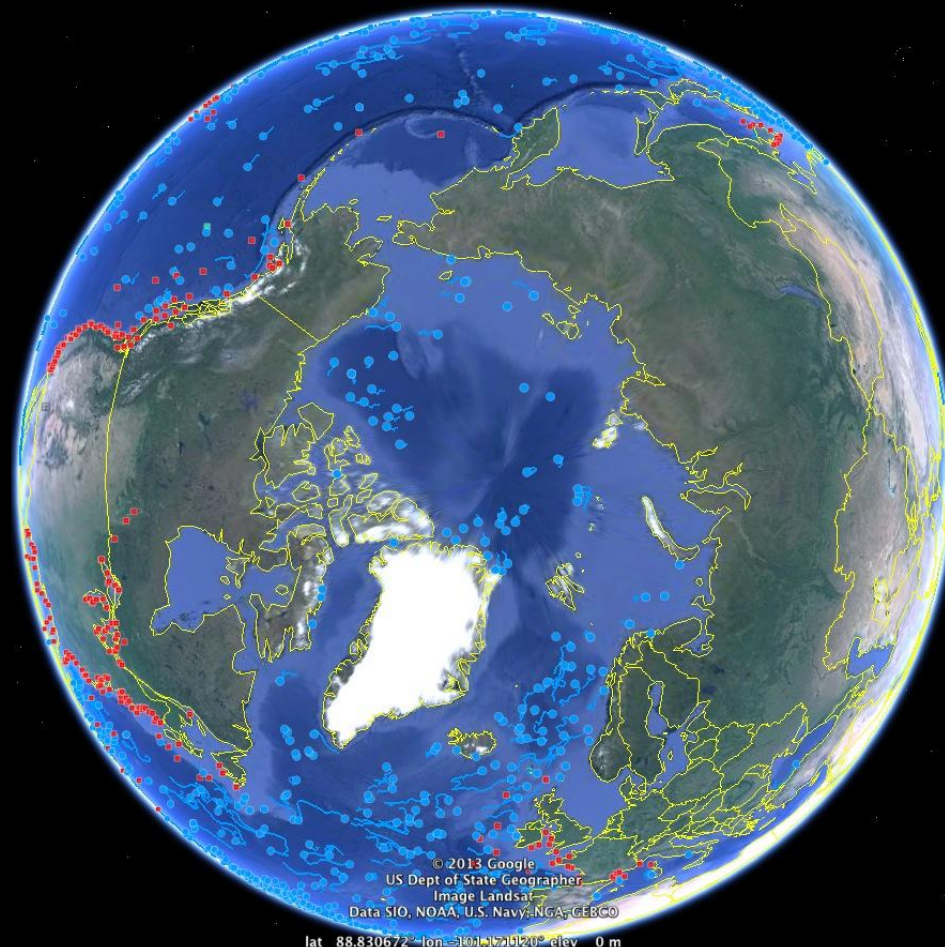
- **Arctic Ocean: Cold and warm waters in/out**
- **Southern Ocean: Clockwise/counter clockwise**
- **Currents/waters guided by bathymetry**
- **Cold/warm waters control ice growth/melt**

Arctic and Antarctic Winds



- **Arctic: Atmospheric patterns determine wind patterns that can force sea ice export out of the Arctic.**
- **Antarctic: Katabatic winds drive sea ice dynamics and impact ice patterns.**

Arctic and Antarctic Buoy Observation Network



Summary

- **Both Arctic and Antarctic sea ice mostly consists of seasonal sea ice.**
- **Arctic sea ice decreases rapidly while Antarctic sea ice increases.**
- **Arctic and Antarctic have different characteristics (bathymetry, currents, water masses, winds, etc.).**
- **Need measurements/observations to identify similarities and differences in sea ice physical processes.**